SPECIFICATIONS

NI 6614

Français Deutsch 日本語 한국어 简体中文

ni.com/manuals

This document lists the specifications of the NI PXIe-6614. The following specifications are typical at 25 °C, unless otherwise noted.

Digital I/O/PFI

Physical Characteristics

Number of channels ..... 40 total, Port 0 (P0.<0..31>), Port 1 (P1.<0..7); or PFI <0..39>

Ground reference ..... GND

Direction control ..... Each terminal individually programmable as input or output

Pull-down resistor ..... 51 kΩ, pulled down to ground

Input voltage protection[1] ..... -3 V to 8 V

Output impedence ..... 75 Ω

Waveform DIO Functionality

Terminals used ..... Port 0 (P0.<0..31>)

Port/sample size ..... Up to 32 bits

Waveform generation (DO) FIFO ..... 2,047 samples

Waveform generation (DI) FIFO ..... 255 samples

DI Sample Clock frequency ..... 0 to 10 MHz, system and bus activity dependent

DO Sample Clock frequency

- Regenerate from FIFO ..... 0 to 10 MHz
- Streaming from memory ..... 0 to 10 MHz, system and bus activity dependent

Data transfers ..... DMA (scatter-gather), programmed I/O

Digital line filter settings ..... 160 ns, 10.24 µs, 5.12 ms, disable

[1] Stresses beyond those listed under *Input voltage protection* may cause permanent damage to the device.

NATIONAL INSTRUMENTS

Timing I/O (PFI) Functionality

Terminals used ..... PFI <0..39>

Functionality ..... Static digital input, static digital output, timing input, timing output

Timing output sources ..... Many counter, DI, and DO timing signals

Debounce filter settings ..... 90 ns, 5.12 µs, 2.56 ms, customer interval, disable; programmable high and low transitions; selectable per input

Recommended Operation Conditions

Level	Minimum	Maximum
Input High voltage, V_{IH}	2 V	5.25 V
Input Low voltage, V_{IL}	0 V	0.8 V
Output High current, I_{OH}	—	-6 mA
Output Low current, I_{OL}	—	6 mA

Electrical Characteristic

Level	Minimum	Maximum
Positive-going threshold, VT+	—	2.0 V
Negative-going threshold, NT-	0.8 V	—
Delta VT hysteresis, VT+ - VT-	0.5 V	—
I_{IL} input low current (V_{in} = 0 V)	—	-10 µA
I_{IH} input high current (V_{in} = 5 V)	—	200 µA

Digital I/O Characteristics

Figure 1. PFI <0..39>/P0/P1: I_{OH} versus V_{OH}

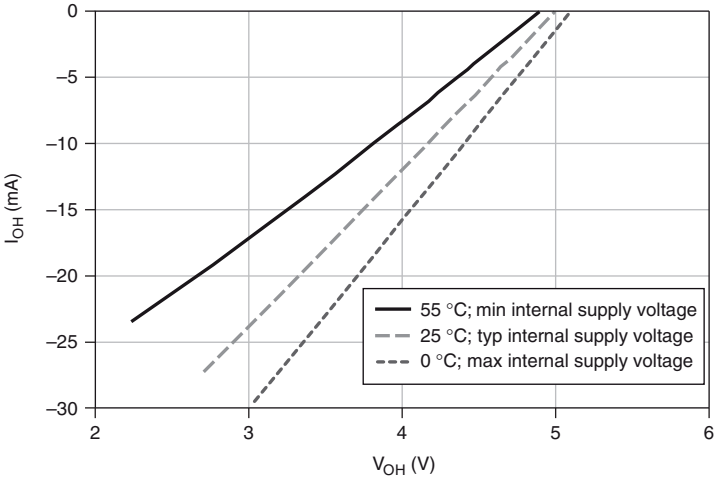
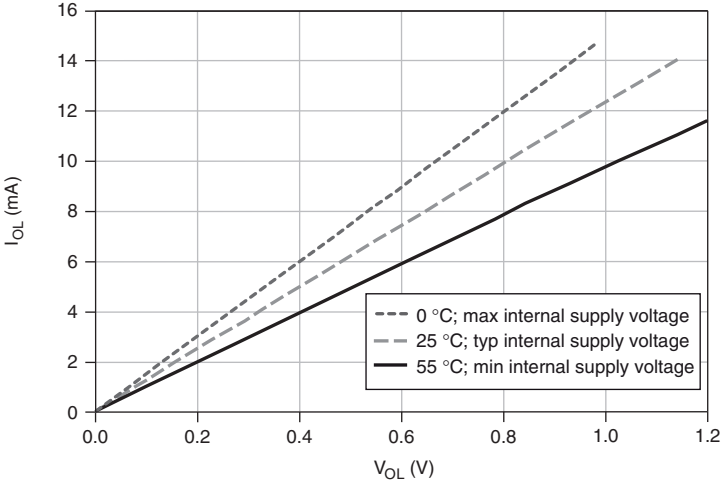


Figure 2. PFI <0..39>/P0/P1: I_{OL} versus V_{OL}



Counters/Timers

Number of counters/timers 8
Resolution ..... 32 bits

Counter measurements

Measurements supported ..... Frequency, edge counting, pulse, pulse-width, semi-period, period, two-edge separation

Table 1. Maximum Source Frequency

Applications	Default Source PFI Lines *,†	Other PFI Lines*	PXI Trigger	PXI Star	PXI_DSTAR <A/B>
Frequency measurement (MHz)	80	50	10	80	100
Edge counting without prescaling (MHz)	25	25	10	25	25
Edge counting with 2x prescaling (MHz)	50	50	10	50	50
Edge counting with 8x prescaling (MHz)	80	50	10	80	100

* The maximum source frequency is dependent on the external source used to drive the PFI lines as well as any cables and accessories used to connect the source to the PXIe-6614. Refer to the *NI 6614 User Manual* at `ni.com/manuals` for more information.

† Default source PFI lines are PFI 11, PFI 15, PFI 19, PFI 23, PFI 27, PFI 31,PFI 35, and PFI 39.

Table 2. Minimum Pulse Width

Applications	Default Source PFI Lines	Other PFI Lines	PXI Trigger	PXI Star	PXI_DSTAR <A/B>
Frequency measurement (ns)	6.25	10	50	6.25	5
Pulse, pulse width, semi-period, period, two-edge separation (ns)	20	20	50	20	20
Edge counting without prescaling (ns)	20	20	50	20	20
Edge counting with 2x prescaling (ns)	10	10	50	10	10
Edge counting with 8x prescaling (ns)	6.25	10	50	6.25	5

Position measurement ..... x1, x2, x 4 quadrature encoding with Channel Z reloading; two-pulse encoding

Output applications ..... Pulse, pulse train with dynamic updates, frequency division, equivalent time sampling

Internal timebases ..... 100 kHz, 20 MHz, 100 MHz

External timebases ..... 0 MHz to 25 MHz; 0 MHz to 100 MHz on PXIe-DSTAR<A,B>

Base clock accuracy ..... See the *OCXO* section

Inputs ..... Gate, Source, HW_Arm, AUX, A, B, Z, Up_Down, Sample Clock

Routing option for inputs

- FIFO ..... 127 samples per counter
- Data transfers ..... Dedicated scatter-gather, DMA controller for each counter/timer

Frequency Generator

Number of channels 1

Base clocks ..... 100 kHz, 10 MHz, 20 MHz

Base clock accuracy ..... Refer to the *Counter measurements* section

Output ..... Any PFI, PXI_TRIG, PXIe-DSTARC

Phase-Lock Loop (PLL)

Number of PLLs 1

Reference clock locking frequencies

Reference Signal	Locking Input Frequency (MHz)
PXIe_DSTAR<A,B>	10, 20, 100
PXI_STAR	10, 20
PXIe_CLK100	100
PXI_TRIG <0..7>	10, 20
PFI <0..39>	10, 20

Output of PLL ..... 100 MHz timebase; other signals derived from 100 MHz timebase including 20 MHz and 100 kHz timebases

OCXO

Nominal Frequency.....10 MHz
Warm-up time .....5 minutes (to within 20 ppb of final frequency)
Retrace error[1] .....±10 ppb
Short term stability.....±0.5 ppb per day (after 30 days of operation)
Long term stability.....±50 ppb per year
System timing slot compatibility .....Yes[2]
Base clock accuracy

Condition*	Value (ppb)†
Temperature drift only	±10
Temperature and 1 year drift (excluding retrace error)	±75
* Within operating temperature range † Definition of 1 ppb = $1/10^9$	

External Digital Triggers

Source .....Any PFI, PXIe-DSTAR<A,B>, PXI_TRIG, PXI_STAR
Polarity.....Software-selectable or most signals
Counter/timer function.....Gate, Source, HW_Arm, Aux, A, B, Z, Up_Down, Sample Clock
Digital waveform generation (DO) function ....Start Trigger, Pause Trigger, Sample Clock, Sample Clock Timebase
Digital waveform acquisition (DI) function .....Start Trigger, Reference Trigger, Pause Trigger, Sample Clock, Sample Clock Timebase

Device-to-Device Trigger Bus

Input source.....PXI_TRIG <0..7>, PXI_STAR, PXIe-DSTAR<A,B>
Output destination.....PXI_TRIG <0..7>, PXIe_DSTAR<C>
Output selections.....10 MHz Clock; frequency generator output; many internal signals
Debounce filter settings .....90 ns, 5.12 µs, 2.56 ms, custom interval, disable; programmable high and low transitions; selectable per input

[1] Retrace is the ability of the OCXO to return to its original frequency after being powered off. Test method: OCXO is turned on for 24 hours, and accuracy is measured. OXCO is turned off for 24 hours, turned on for 2 hours, and accuracy is measured again. The difference between the two measurements is the retrace error.

[2] OCXO provides the backplane with an accurate 10 MHz clock. Refer to the *NI 6614 User Manual* at `ni.com/manuals` for more information.

Bus Interface

Form factor ..... x1 PXI Express, single slot, PXI Express Hardware Specification Revision 1.0 ECN-1 compliant

Slot compatibility ..... x1 and x4 PXI Express, PXI Express hybrid, or PXI Express System Timing Slot

Calibration[1]

Recommended warm-up time..... >30 minutes

Recommended calibration interval..... 1 year

Power Requirements

+3.3 V ..... 5.9 W maximum

+12 V ..... 15.9 W maximum

Physical Requirements

Weight ..... 180 g

Current Limits

Caution Exceeding the current limits may cause unpredictable behavior by the device and/or chassis.

+5 V Terminal (at Pin 1 of Figure 3) ..... +4.25 V to +5.10 V, 1 A maximum

Environmental

Maximum altitude..... 2,000 m (at 25 °C ambient temperature)

Pollution Degree 2

Indoor use only.

[1] Refer to the *NI 6614 Calibration Procedure* at `ni.com/manuals` for more information about calibrating your device.

Operating Environment

Ambient temperature range ..... 0 to 55 °C
(Tested in accordance with IEC 60068-2-1 and IEC 60068-2-2. Meets MIL-PRF-28800F Class 3 low temperature limit and MIL-PRF-28800F Class 2 high temperature limit)

Relative humidity range..... 10% to 90%, noncondensing
(Tested in accordance with IEC 60068-2-56.)

Storage Environment

Ambient temperature range ..... -40 to 71 °C
(Tested in accordance with IEC 60068-2-1 and IEC 60068-2-2. Meets MIL-PRF-28800F Class 3 limits.)

Relative humidity range..... 5% to 95%, noncondensing
(Tested in accordance with IEC 60068-2-56.)

Shock and Vibration

Operational shock ..... 30 g peak, half-since, 11 ms pulse
(Tested in accordance with IEC-60068-2-27. Meets MIL-PRF-28800F Class 2 limits.)

Random vibration

- Operating ..... 5 Hz to 500 Hz, 0.3 g_{rms}
- Nonoperating ..... 5 Hz to 500 Hz, 2.4 g_{rms}

(Tested in accordance with IEC-60068-2-64. Nonoperating test profile exceeds the requirements of MIL-PRF-28800F, Class 3.)

Note Clean the device with a soft, non-metallic brush. Make sure that the device is completely dry and free from contaminants before returning it to service.

Safety

This product meets the requirements of the following standards of safety for electrical equipment for measurement, control, and laboratory use:

- IEC 61010-1, EN 61010-1
- UL 61010-1, CSA 61010-1

Note For UL and other safety certifications, refer to the product label or the *Online Product Certification* section.

Electromagnetic Compatibility

This product meets the requirements of the following EMC standards for electrical equipment for measurement, control, and laboratory use:

- EN 61326-1 (IEC 61326-1): Class A emissions; Basic immunity
- EN 55011 (CISPR 11): Group 1, Class A emissions
- EN 55022 (CISPR 22): Class A emissions
- EN 55024 (CISPR 24): Immunity
- AS/NZS CISPR 11: Group 1, Class A emissions
- AS/NZS CISPR 22: Class A emissions
- FCC 47 CFR Part 15B: Class A emissions
- ICES-001: Class A emissions

Note In the United States (per FCC 47 CFR), Class A equipment is intended for use in commercial, light-industrial, and heavy-industrial locations. In Europe, Canada, Australia and New Zealand (per CISPR 11) Class A equipment is intended for use only in heavy-industrial locations.

Note Group 1 equipment (per CISPR 11) is any industrial, scientific, or medical equipment that does not intentionally generates radio frequency energy for the treatment of material or inspection/analysis purposes.

Note For EMC declarations and certifications, and additional information, refer to the *Online Product Certification* section.

CE Compliance CE

This product meets the essential requirements of applicable European Directives as follows:

- 2006/95/EC; Low-Voltage Directive (safety)
- 2004/108/EC; Electromagnetic Compatibility Directive (EMC)

Online Product Certification

To obtain product certifications and the Declaration of Conformity (DoC) for this product, visit `ni.com/certification`, search by model number or product line, and click the appropriate link in the Certification column.

Environmental Management

NI is committed to designing and manufacturing products in an environmentally responsible manner. NI recognizes that eliminating certain hazardous substances from our products is beneficial to the environment and to NI customers.

For additional environmental information, refer to the *Minimize Our Environmental Impact* web page at `ni.com/environment`. This page contains the environmental regulations and directives with which NI complies, as well as other environmental information not included in this document.

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EU Customers At the end of the product life cycle, all products *must* be sent to a WEEE recycling center. For more information about WEEE recycling centers, National Instruments WEEE initiatives, and compliance with WEEE Directive 2002/96/EC on Waste and Electronic Equipment, visit `ni.com/environment/weee`.

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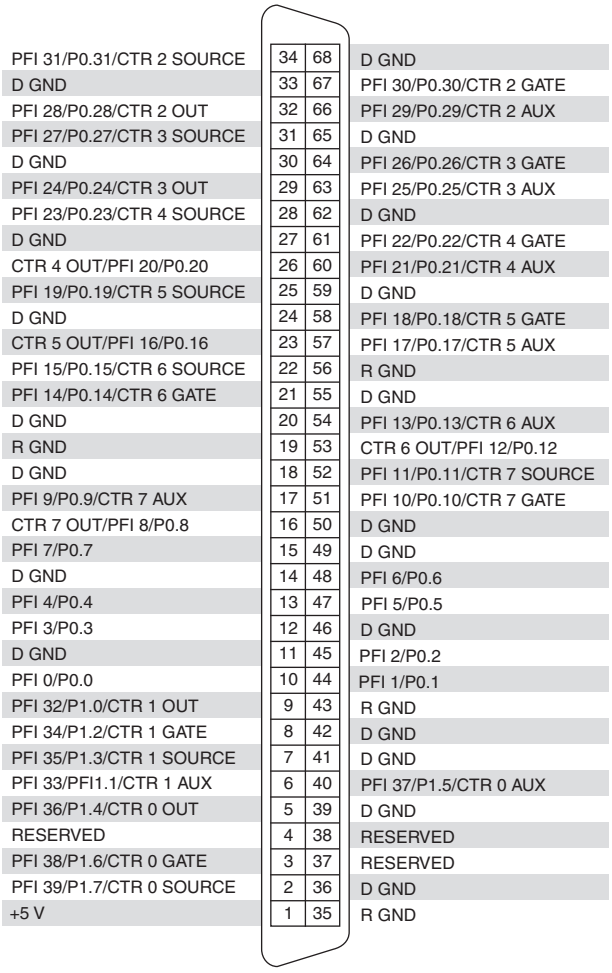
Pinout Diagram

Figure 3. NI 6614 Pinout


PFI 31/P0.31/CTR 2 SOURCE 34 68 D GND
D GND 33 67 PFI 30/P0.30/CTR 2 GATE
PFI 28/P0.28/CTR 2 OUT 32 66 PFI 29/P0.29/CTR 2 AUX
PFI 27/P0.27/CTR 3 SOURCE 31 65 D GND
D GND 30 64 PFI 26/P0.26/CTR 3 GATE
PFI 24/P0.24/CTR 3 OUT 29 63 PFI 25/P0.25/CTR 3 AUX
PFI 23/P0.23/CTR 4 SOURCE 28 62 D GND
D GND 27 61 PFI 22/P0.22/CTR 4 GATE
CTR 4 OUT/PFI 20/P0.20 26 60 PFI 21/P0.21/CTR 4 AUX
PFI 19/P0.19/CTR 5 SOURCE 25 59 D GND
D GND 24 58 PFI 18/P0.18/CTR 5 GATE
CTR 5 OUT/PFI 16/P0.16 23 57 PFI 17/P0.17/CTR 5 AUX
PFI 15/P0.15/CTR 6 SOURCE 22 56 R GND
PFI 14/P0.14/CTR 6 GATE 21 55 D GND
D GND 20 54 PFI 13/P0.13/CTR 6 AUX
R GND 19 53 CTR 6 OUT/PFI 12/P0.12
D GND 18 52 PFI 11/P0.11/CTR 7 SOURCE
PFI 9/P0.9/CTR 7 AUX 17 51 PFI 10/P0.10/CTR 7 GATE
CTR 7 OUT/PFI 8/P0.8 16 50 D GND
PFI 7/P0.7 15 49 D GND
D GND 14 48 PFI 6/P0.6
PFI 4/P0.4 13 47 PFI 5/P0.5
PFI 3/P0.3 12 46 D GND
D GND 11 45 PFI 2/P0.2
PFI 0/P0.0 10 44 PFI 1/P0.1
PFI 32/P1.0/CTR 1 OUT 9 43 R GND
PFI 34/P1.2/CTR 1 GATE 8 42 D GND
PFI 35/P1.3/CTR 1 SOURCE 7 41 D GND
PFI 33/PFI1.1/CTR 1 AUX 6 40 PFI 37/P1.5/CTR 0 AUX
PFI 36/P1.4/CTR 0 OUT 5 39 D GND
RESERVED 4 38 RESERVED
PFI 38/P1.6/CTR 0 GATE 3 37 RESERVED
PFI 39/P1.7/CTR 0 SOURCE 2 36 D GND
+5 V 1 35 R GND

R GND: Pins are not connected to Ground if using an SH68-68-D1 shielded cable; Pins are connected to D GND if using an R6868 ribbon cable.

RESERVED: Should not be used as these pins are weakly pulled down to D GND.

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